

Attorney Docket No. P118-US

REMARKS

Claims 1-80 are pending; and no claims stand allowed.

Claims 1, 15, 24-26, 53, 63, and 72 are amended to remove the informalities thereof. Claims 4, 22-23, 65, and 74-78 are cancelled in favor of the prosecution of the remaining pending claims. Claim 79 is amended to maintain proper dependency due to cancellation of claim 74.

Independent claim 1 was rejected in the Office Action under 102(b) as being anticipated by Tai (US 6,436,229). The undersigned respectfully submits that this rejection was in error.

Claim 1 expressly recites, among other features the step of providing the additional amount of the etchant recipe to the etch system at a time that is determined based on a measurement of an amount of a chemical species. This feature is nowhere disclosed or suggested by Tai. The Examiner indicated in the Office Action that the paragraph from line 57 to line 60 of column 4 of Tai discloses the above feature. However, the undersigned can not find any such description. Instead, the paragraph at line 57-60 of column 4 discusses the high etching rate of BrF_3 and a "diffusion limited effect" that is defined as "when a reaction is limited by the time the molecules come in contact with the surface rather than the amount of reactants." There is nothing in this section, or anywhere in Tai, that teaches or suggests measuring an amount of a chemical species and providing an additional amount of etchant recipe based on the measured chemical species. It is hoped that the Examiner will reconsider the Tai teachings and in turn reconsider the propriety of the rejection of claim 1 in view of Tai. Because, it is respectfully submitted, Tai fails in teaching or suggesting all features of claim 1, claim 1, as well as claims 2-8 that are dependent from claim 1, is patentable over Tai. Reconsideration and withdrawal of the rejection of the claims under section 102(b) in view of Tai, are respectfully requested.

Independent claim 63 was rejected in the Office Action under 103(a) as being obvious over Tai in view of Winningham (US 6,518,194). This rejection is respectfully traversed.

Claim 63 expressly recites, among other features, the step of etching the second microstructure in the second etching process using the etchant recipe based on the collected data of the parameter in the first etching process. Tai does not disclose or suggest this feature, as indicated by the Examiner. The Examiner states that the deficiency in Tai is remedied by Winningham (example 8). The undersigned respectfully submits that there is no motivation to combine Tai and Winningham. Tai is related to gas phase silicon etching with BF_3 , while the example 8 of Winningham is related to etching Cr coated bionanomasks applied directly to a silicon substrate using H_2 and SF_6 as etchant – two completely different processes and products.

Even forced to combine the two references, Winningham does not remedy the deficiency of Tai. More particularly, claim 63 is amended to more particularly bring out an embodiment of applicant's –

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namely etching with a spontaneous vapor phase etchant, and collecting data where the data is a detected chemical species during the etch. Neither Tai nor Winningham teach or suggest these further features as set forth in claim 63. Because the combination of Tai and Winningham does not disclose or suggest all features of claim 63, claim 63, as well as claims 64 and 66-71 that are dependent from claim 63, is patentable over Tai and Winningham. Reconsideration and withdrawal of the rejection are respectfully requested.

As for the Examiner's rejection of claim 72 under 102(b) over Tai, this rejection is also respectfully traversed.

Claim 72 expressly recites, among other features, the step of collecting a plurality of data of a parameter that characterizes an etching process using an etchant recipe that comprises a spontaneous vapor phase etchant comprising XeF_2 ; storing the collected data; and etching a microstructure using the etchant recipe based on the collected data of the parameter. In contrast, lines 30-38 at column 5 of Tai discusses the "... characteristics of BrF_3 gas ..." and "In order to exploit these characteristics (of the BrF_3 gas), etching processes are preferably conducted using pulse BrF_3 flow etching." (with the notes added by the undersigned in parentheses). Because Tai does not disclose or suggest all features recited in claim 72, claim 72, as well as claims 73-80, is patentable over Tai. Reconsideration and withdrawal of the rejection are respectfully requested.

With respect to the Examiner's rejection of claim 53 under 102(b) over Zhang, the undersigned respectfully submits that the rejection was in error.

Claim 53 expressly recites, among other features, the step of providing the etchant recipe to the etch chamber over time, wherein the amount of the etchant is varied when the change of the measured parameter is beyond the predetermined value. Instead, table 2 of Zhang details an etching cycle, where a variety of gaseous components are passed through the etching chamber for certain time periods – only one of which is an "etchant recipe". Specifically, the etching cycle of Table 2 in Zhang includes a) an initial purge with N_2 , b) a pretreatment step with N_2 and vapor H_2O , c) an etch step with N_2 , vapor H_2O and vapor HF, d) removing residual HF with vapor H_2O , followed by a "high purge" with N_2 . In Zhang, there is only a single etch step (using N_2 , vapor H_2O and HF) – there is no varying of the amount of Zhang etchant recipe over time. The statements in column 5, lines 30 to 50 in Zhang are directed to how *two different* etch processes would happen – not a changing of the amount of the etch recipe for an etch of the same sample. The statement "the speed of this 'etch' operation is enhanced by adding H_2O to the vapor HF" is an explanation of why H_2O is part of the etchant recipe. Whereas the statement "eliminating vapor H_2O from this process reduces the etching rate to about 60 angstroms per 10 seconds" is specific data/evidence of why, if H_2O had not been included, the etch rate would have been much

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slower. Zhang does not etch any sample with two different etch recipes – one with and one without H₂O. Zhang does not teach or suggest varying an amount of etchant in an etching method based on a change of a measured parameter being beyond a predetermined value. Because Zhang fails in disclosing or suggesting all features of claim 53, claim 53, as well as claims 54-62 that are dependent from claim 53, is patentable over Zhang. Reconsideration and withdrawal of the rejection are respectfully requested.


Independent claim 30 was rejected under 102(b) over Zhang (6,162,585). In particular, the Examiner stated that the feature of “the amount of the etchant recipe per time unit varies” recited in claim 30 is disclosed in table 2 of Zhang. It is respectfully submitted that the Examiner above statement was in error; and the rejection is respectfully traversed.

As discussed above with reference to the Examiner’s rejection to claim 53, table 2 of Zhang details an etching cycle, where a variety of gaseous components are passed through the etching chamber for certain time periods – only one of which is an “etchant recipe”. Table 2 does not disclose or suggest the feature that the amount of etchant recipe per unit time varies. Because Zhang fails in disclosing or suggesting all features of claim 30, claim 30, as well as claims 31-52 that are dependent from claim 30, is patentable over Zhang. Reconsideration and withdrawal of the rejection are respectfully requested.

It is believed that this application is in condition for allowance. Favorable consideration and prompt allowance are respectfully requested. In the event any fees are required in connection with this paper, please charge our Deposit Account No. 501516.

Respectfully submitted,

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